

IS-5: Achieving Irrigation Water Management (IWM) with Pivot Sprinkler System

Basic Requirements:

- Water Source
- Pumping Plant
- Power Source
 - Mainline
 - Laterals
 - Sprinklers
- Chemigation Valves
 - Pressure Gauge
 - Water Meters



LEPA System

Low Energy Precision Spray



LESA System

Low Elevation Spray

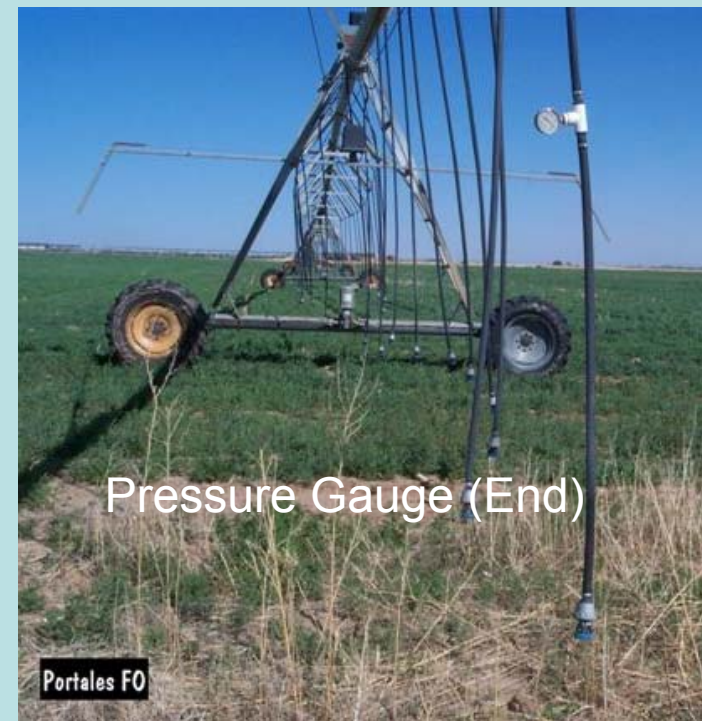


MESA System

Mid Elevation Spray

Page 2	Title	Purpose
Page 1	Achieving Irrigation Water Management (IWM) with Pivot Sprinkler Systems	To describe the basic requirements of pivot sprinkler systems
Page 2	Table of Contents	Table of Contents
Page 3	Pictures of basic sprinkler system hardware	To demonstrate the components that are required for a sprinkler system
Page 4	Pictures of basic LEPA system characteristics	To demonstrate agronomic characteristics of a lepa system
Page 5	Characteristics of Pivot sprinkler systems	Criteria: Design Capacity, Design App. Rate, Distribution Patterns, Nozzle Spacing, Heights, Slopes.
Page 6	System Planning and Design	Planning, Design and System Performance Requirements
Page 7	Crop and Soil Characteristics	Needed for planning & design and used for IWM documentation of irrigation efficiencies achieved
Page 8	Detailed Evaluation for Center Pivot Lateral Worksheet	Catch Can Data Worksheet
Page 9	System Evaluation and Potential Water Savings	Evaluates system performance
Page 10	Pictures of a basic sideroll irrigation system	To demonstrate basic characteristics of a sideroll system

NOTE: The above information and documentation is intended to serve as a simple-to-use GUIDE by producers, Natural Resource Conservation Service (NRCS) planners and others involved in Irrigation Water Management. For further assistance on the use of this GUIDE, contact your local NRCS.



Furrow Diking

Soft Middles



Portales F0

8/1/2001

CHARACTERISTICS OF PIVOT SYSTEMS

Criteria	Center Pivot or Linear Move	LEPA	LESA	LPIC & MESA
Design Capacity	Either: Capacity to meet the peak water demands of all irrigated crops in the design area, Or: Capacity adequate to meet requirements of selected irrigations during critical crop growth periods when planning less than full irrigation			
Design Application Rate	Runoff, translocation and unplanned deep percolation shall be minimized			
Distribution Patterns	CU \geq 85% or DU \geq 76%, Nozzles \leq 7 ft. high shall have a CU \geq 90%	CU \geq 94%	CU \geq 94%	CU \geq 90% for nozzles \leq 7 ft. high, CU \geq 85% for MESA for nozzles greater than 7 ft. high
Nozzle Spacing	Spray Nozzles shall be \leq 25% of wetted diameter, and Impact Nozzles shall be \leq 50% wetted diameter	Not to exceed twice the row spacing of the crop or 80 inches		Not to exceed every other row when operated in canopy for 50% or more of the growing season
Heights	Varies	8 - 18 inches	12 – 24 inches	5 – 10 feet
Slope	Not to exceed 20%	Not to exceed 1% on more than 50% of the field	Not to exceed 3% on more than 50% of the field	Not to exceed 3% on more than 50% of the field for fine textured soils, and not to exceed 5% on more than 50% of the field for coarse textured soils

SYSTEM PLANNING & DESIGN

PLANNING

Calculate the required system capacity

Determine water availability

Estimate your irrigated area

Physical considerations- H2O quality, Soil variations

DESIGN

Pivot- labor savings, operating costs

SYSTEM PERFORMANCE

System checks

System Capacity

System Uniformity

System Average Application Rate

System Field Application Efficiency

PLANNING			DESIGN		SYSTEM PERFORMANCE		
Calculate the required system capacity	Q= $\frac{453 \text{ Ad}}{f \text{ T}}$	Area (ac)	120	Pivot	Labor Operating Cost Sprinkler Package	System Checks	The supplier should provide this service 1. System Capacity 2. Distribution Uniformity 3. Energy Consumption
		Depth of water applied (in)	2				
		Irrigation period (days/interval)	3				
		Operating time (hrs/day)	24				
		Flow rate (gpm)	1510				
Determine water availability	This is done through well testing				System Capacity	Q= $\frac{453 \text{ Ad}}{f \text{ T}}$ A=Irrigated area (acres) d=Gross depth of water applied (in.) f= Irrigation period (#days in #day interval) T=hrs./day (operating system)	
Estimate your irrigated area	A= $\frac{Q \text{ f T}}{453 \text{ d}}$	Flow rate (gpm)	1000			System Uniformity	Catch Can
		Depth of water applied (in)	2				
		Irrigation period (days/interval)	2				
		Operating time (hrs/day)	24				
		Area (ac)	53				
Physical considerations	H2O quality, Soil variations				System Average Application Rate	Ratio of nozzle flow rate to its wetted area Where AAR exceeds the infiltration rate runoff results	
					System Field Application Efficiency	App. Eff. = $\frac{\text{Irr. Water available to crop}}{\text{Volume of water supplied}} \times 100$	

NOTE:.

Soil (Series, Texture, and Map Unit) *Select the soil to manage for:*Critical soil to manage: **Zia SL; 91**

Intake Family (in/hr):

0.75**Soil Interpretations for Irrigation**

Crop Name	Rooting Depth	Moisture Replacement Depth (ft)	Water Holding Capacity (in)	Mgt Allowed Depletion (MAD) (%)	Net Water to Replace (in)	Time Needed to Infiltrate (hrs)
Alfalfa, hay, northern; Albuquerque	Deep	4.0	5.0	50%	2.5	2.0

Crop Consumptive Use (CU) Information *(inches/month needed)*

Crop:	Alfalfa, hay, northern; Albuquerque		Total Irrigation Needed:	41.5 ac in/ac	
Month	Est. Frequency (days between irr.)	In/Mo	Month	Est. Frequency (days between irr.)	In/Mo
Jan		0.0	Jul	8	9.7
Feb		0.0	Aug	10	7.8
Mar		0.0	Sep	14	5.3
Apr	>1 Mo.	1.4	Oct	>1 Mo.	2.2
May	12	6.1	Nov		0.0
Jun	8	9.0	Dec		0.0

Detailed Evaluation Center Pivot Lateral Worksheet

Catch Can Spacing					ft	Low 1/4 Summation				
Can No.	Factor No.	Catch (cc)	Catch x Factor	Catch (in.)		Can No.	Factor No.	Catch (cc)	Catch x Factor	Catch (in.)
1			0	0.00		44	44	35	1540	0.18
2			0	0.00					0	0.00
3			0	0.00					0	0.00
4	4	60	240	0.30					0	0.00
5			0	0.00		36	36	55	1980	0.28
6			0	0.00		28	28	55	1540	0.28
7			0	0.00					0	0.00
8	8	70	560	0.35					0	0.00
9			0	0.00						
10			0	0.00						
11			0	0.00						
12	12	75	900	0.38						
13			0	0.00						
14			0	0.00						
15			0	0.00						
16	16	70	1120	0.35			108		5060	
17			0	0.00						
18			0	0.00						
19			0	0.00						
20	20	80	1600	0.40						
21			0	0.00						
22			0	0.00						
23			0	0.00						
24	24	60	1440	0.30						
25			0	0.00						

Max application rate			Catch Time	
data for			5 min	
1		15		
2		25		
3		35		
4		25		
5		20		
		35		

SYSTEM EVALUATION AND POTENTIAL WATER SAVINGS

Existing System Data						
Crop	Stage of growth	Hours per revolution	Speed setting	Annual Net application (in)	Hours operated per day	Revolutions per season
alfalfa	16"	26	50%	14.9	24	80
Distance from/to		End tower speed		System Flow Rate		
pivot point	pivot point	Distance (ft)	Time (min)	Flow rate (gpm)	Method of measuring flow	
end tower	wetted edge					
1205	1345	50	10.8	850	flow meter	
System Evaluation						
Circumference of end tower (ft)		End tower speed (ft/hr)	Hours per revolution	Area irrigated (ac)	Gross app. per irrigation (in)	
7571		278	27.3	130.5	0.39	
Catch Can Evaluation						
Weighted system ave. application (cc)	Average Application (in)	Weighted low 1/4 ave. application (in)	Low 1/4 Average Application (in)	DU	CU	
58.94	0.29	46.85	0.23	79.49	87.08	
Re	Eq	Application (in)	Max ave. app. Rate (in/day)	Pivot revolutions required	Annual Gross application (in)	
0.752	59.760219	0.21	2.10	64	24.9	
Potential Water Savings						
Potential Application Efficiency %	Potential annual gross applied (in)	Total Water Conserved (ac-ft)				
80	18.6	68.6				

Sideroll Irrigation

